Claims

1. A method for acoustic detection of a leak behind a casing (23) of a borehole, the leak generating a discrete acoustic signal, the method comprising
   - sampling an acoustic amplitude (AA) during a recording time period (24 ; 64) at a determined position along the borehole,
   - defining time intervals (26 ; 66) inside of the recording time period (24),
   - processing for each time interval (26) the measured acoustic amplitudes to obtain respectively a corresponding power-frequency spectrum (261),
   - analysing a plurality of the power-frequency spectra to identify the discrete acoustic signal by detecting time and frequency dependant changes of power.

2. The method of claim 1, wherein the processing is performed using a Fourier transform analysis

3. The method according to any one of claims 1 or 2, wherein the time intervals are of same duration and subsequent time intervals are adjacent to each other in order to cover a continuous portion of the recording time period.

4. The method according to anyone of claims 2 to 3, further comprising
   - plotting the power-frequency spectra in a power-frequency-time plot graph (27 ; PFT1, PFT2, ..., PFTn),
   - identifying a surface (28, 29 ; 31 ; 51) of the power-frequency-time plot graph wherein a value of power corresponds to a predetermined value,
   - analysing the identified surface to detect the discrete acoustic signal.

5. The method according to any one of claims 1 to 4, wherein a duration of the recording time period is adapted to measure at least one discrete acoustic signal.

6. The method according to any one of claims 1 to 5, wherein the sampling is performed at one or a plurality of further determined positions along the borehole in order to investigate a section of the borehole covered by the determined and further determined positions.

7. The method according to claim 4, wherein the sampling is performed at one or a plurality of further determined positions along the borehole in order to investigate a section of the borehole covered by the determined and further determined positions, and wherein the power-frequency-time plots resulting from the measured acoustic amplitudes are aligned into an extended graph in an order corresponding to successive positions of the borehole, the extended graph showing frequency and time dependant power values as occurring along the borehole.

8. The method according to any one of claims 1 to 7, wherein the sampling is done at an acquisition rate between 30 kHz and 50 kHz.

9. A method for detection of a leak behind a casing of a borehole, comprising
   - investigating a portion of the borehole using a first investigation method to obtain a first result of investigation,
   - investigating the portion of the borehole using a method according to anyone of claims 1 to 8 to obtain a second result of investigation,
   - comparing the first result of investigation with the second result of investigation to identify a correlation between the first result and the second result.

10. A method for repairing a leak behind a casing of a borehole, comprising
   - Detecting the leak using a method according to anyone of claims 1 to 9,
   - Activating a repair process for repairing the leak

11. The method for repairing a leak according to claim 10, wherein the repair process comprises perforating the casing to obtain an opening and squeezing a repair fluid in the opening.

12. The method for repairing a leak according to claim 10, wherein the repair process comprises milling out the casing around the leak and placing a plug of sealing fluid to cover at least an entire volume milled out from the casing.